REMARKS

In response to the Official Action mailed on May 23, 2011, the application has been amended. No new matter has been added. Reconsideration of the rejections of the claims is respectfully requested in view of the above amendments and the following remarks.

Examiner Zhu is thanked for granting an interview to discuss the present application on June 21, 2011. At the interview, the differences between the claims of the present application and the Goudarzi reference (US 2006/0021466 A1) were discussed.

On page 2 of the Official Action, claim 17 was rejected under 35 USC 112 as supposedly failing to comply with the written description requirement. According to the Official Action, the recitation of "at least 20°C" in claim 17 is not supported by the specification as filed. This rejection is respectfully traversed. As pointed out at the interview held on June 21, 2011, this recitation in claim 17 is supported by Table 1 on page 16 of the application as filed, which shows multiple examples of the present invention in which the difference in the main peak temperatures of first and second solder alloys is at least 20°C. Accordingly, the rejection of claim 17 under 35 USC 112 is improper and should be withdrawn.

On page 3 of the Official Action, claims 8 - 23 were

rejected under 35 USC 103(a) as unpatentable over Goudarzi et al (US 2006/0021466 A1, referred to below as Goudarzi). This rejection is respectfully traversed.

Claim 8 describes a lead-free solder paste comprising powders of a first and second solder alloy, in which the first solder alloy contains 6 - 20 mass % of In. Goudarzi does not disclose or suggest such a solder paste. For purposes of more specifically setting forth the subject matter being claimed, as proposed at the interview held on June 21, 2011, claim 8 has been amended to specify the compositions of the first and second solder alloys and to clarify that the first solder alloy does not contain Cu, while the second solder alloy may contain Cu but does not contain In. Amended claim 8 is supported by Table 1 of the present application as filed. In all of the examples of the present invention shown in that table, the first solder alloy contains In and no Cu, while the second solder alloy may contain Cu but does not contain In. Claim 8 has also been amended to incorporate the features of claim 15 that the first solder alloy has a lower main peak temperature than the second solder alloy.

Goudarzi discloses a solder paste which is a mixture of first and second alloys which differ from each other with respect to their liquidus temperatures by at most 15°C. Goudarzi does not define the compositions of the first and second alloys in detail. The only specific example of the first alloy is a Sn-Ag-Cu alloy (paragraph 0022), and the only specific example of the

second alloy is a Sn-Ag alloy (paragraphs 0024 and 0025).

Paragraphs 0012 and 0020 of Goudarzi state that in one embodiment, the first alloy comprises Sn, Ag, and at least one additional metal which can be selected from the group consisting of Cu, Zn, Bi, Ni, and In. The Official Action considers this to mean that Goudarzi discloses that the first alloy can be a Sn-Ag-In or a Sn-Ag-In-Bi alloy. However, there is no specific disclosure in Goudarzi of any such alloys, and even if a person skilled in the art were to conclude that such alloys could be employed as the first alloy, he would not know the permissible contents of In and/or Bi.

The only description in Goudarzi of the appropriate amounts of the elements Zn, Bi, Ni, and In is found in paragraph 0021 which states that in an embodiment in which the first alloy comprises Sn, Ag, Cu, and a fourth metal selected from Zn, Bi, Ni, and In, the content of the fourth metal should be from about 0.1 to about 5 wt %.

According to page 6 of the Official Action, paragraph 0021 of Goudarzi does not limit the In content for the first alloy to at most 5 wt % except when In is added to a Sn-Ag-Cu alloy. However, even though Goudarzi mentions the content of In (or other fourth metal) only in connection with an alloy also containing Sn, Ag, and Cu, Goudarzi does not give any other guidance to a person skilled in the art concerning the

appropriate content of In in the first alloy. From these facts, a person skilled in the art would conclude that the content of In should be no higher than 5 wt % for any composition of the first alloy.

The technical knowledge of a person skilled in the art of solder alloys would also lead that person to conclude that the In content in the first alloy of Goudarzi must never be higher than 5 wt %. This fact is supported by the attached declaration under 37 CFR 1.132 by Mr. Kaichi Tsuruta, who is one of the inventors of the present application. As set forth in the declaration, it is well known by those skilled in the art of solder alloys that Cu and In have opposite effects in a solder alloy. Specifically, In has the effect of lowering the melting point of an alloy, while Cu has the effect of increasing the melting point.

As explained on pages 3 and 4 of the declaration, since Cu and In have opposite effects on melting point, the suitable content of In the first alloy of Goudarzi (if present) depends upon the content of Cu in the first alloy. If the Cu content of the first alloy is decreased, the In content of the first alloy must also be decreased to achieve the desired result. According to Goudarzi, the maximum permissible content of In in the first alloy when the first alloy is a SnAgCuIn alloy is 5 wt %. Therefore, as set forth at the bottom of page 4 and the top of page 5 of the declaration, if Cu were eliminated from the first alloy of Goudarzi and the first alloy were a SnAgIn alloy (a

situation hypothesized by the Official Action), the In content of the first alloy would need to be decreased compared to the maximum permissible content of In (5 wt %) when the first alloy of Goudarzi is a SnAgCuIn alloy. As stated at the top of page 5 of the declaration, if the first alloy of Goudarzi were a SnAgIn alloy, an In content in this first alloy as high as 5 wt % would be contrary to the logic of paragraph 0021 of Goudarzi.

Therefore, as explained on page 5 of the declaration, if the disclosure of Goudarzi is logically consistent, then the In content of the first alloy of Goudarzi can never be greater than 5 wt % and must be lower when the first alloy is SnAgIn than when it is SnAgCuIn.

Thus, in accordance with the teachings of Goudarzi, the In content of the first alloy can never be 6 mass % or above, and the paste of Goudarzi can never satisfy the requirements of claim 8 concerning the In content of the first alloy. The Official Action has not shown any reason why a person skilled in the art would ignore the teachings of Goudarzi and modify Goudarzi to have a first alloy with an In content of at least 6 mass % as set forth in claim 8. Therefore, the rejection of claim 8 fails to set forth a *prima facie* case of obvious and is improper. Claim 8 and claims 9, 13, 16, 17, and 19 - 22 which depend from claim 8 are therefore allowable. Claims 10 - 12, 14 - 15, 18, and 23 have been cancelled as redundant in light of the amendment of claim 8, so the rejections of these claims are now moot.

In addition to the above-mentioned amendments, claim 19 has been amended to depend from claim 8, since claim 11 from which it previously depended has been cancelled. Furthermore, claims 20 - 22 have been amended to change "alloy" and "alloys" to "solder alloy" and "solder alloys", respectively, to match the language used in the earlier claims. The words "alloy" and "alloys" were inadvertently omitted from these claims.

Claim 13 is allowable as depending from claim 8 and is further allowable in its own right. Claim 13 states that the first solder alloy is selected from a Sn-Ag-In alloy and a Sn-Ag-In-Bi alloy, and the second solder alloy is selected from a Sn-Ag-Cu alloy and a Sn-Ag-Bi-Cu alloy. In Goudarzi, the only option presented for the second alloy is a Sn-Ag alloy, and there is no suggestion in Goudarzi of a solder paste in which each of a first alloy and a second alloy has three or more components, as set forth in claim 13.

Paragraph 0009 of Goudarzi states that "More preferably, the second alloy comprises Sn and Ag". The Official Action assigns great significance to the words "more preferably" and concludes that these words mean that the second alloy may contain a variety of different elements other than Sn and Ag. However, the only possibility for the second alloy disclosed by Goudarzi is a SnAg alloy. There are no merely preferable operation (as opposed to a "more preferable" option) or less preferable option for the second alloy. A SnAg alloy is the only option presented in

Goudarzi, and there is no basis for a person skilled in the art to conclude that the second alloy can be anything except a SnAg alloy. As such, the argument by the Official Action that it would obvious for a person skilled in the art to modify the second alloy of Goudarzi to include additional alloying elements is unreasonable, and the rejection of claim 13 fails to set forth a *prima facie* case of obviousness. Claim 13 is thus allowable.

Claim 17 further patentably distinguishes the present invention from Goudarzi. Claim 17 states that the difference in the main peak temperatures of the first and second solder alloys of claim 8 is at least 20 °C. Goudarzi does not disclose or suggest such a feature. According to paragraph 0026 of Goudarzi, the liquidus temperature of the first alloy and the liquidus temperature of the second alloy differ from each other by not greater than 15°C, preferably by not more than greater than 10°C, and more preferably by not more than 5°C. In other words, the difference between the liquidus temperatures in Goudarzi is preferably as small as possible. A difference in main peak temperatures of at least 20°C as set forth in claim 17 is totally contrary to the teachings of Goudarzi.

Regarding claim 17, page 5 of the Official Action dismisses the features of this claim as being merely the result of optimization of a result-effective variable, and in support of this assertion cites MPEP 2144.05(II). It is respectfully submitted that the Official Action is misapplying the concept of

basing an obviousness rejection on optimization of a variable. As is clear from MPEP 2144.05(II), optimization can potentially be the basis of an obviousness rejection if a claim is merely optimizing within a broad set of values disclosed by the prior art. However, this is not the case with respect to claim 17 and Goudarzi. Goudarzi makes it very clear that the maximum permissible difference between the liquidus temperatures of first and second alloys is at most 15°C. Making the difference in the main peak temperatures of the first and second solder alloys at least 20 °C as set forth in claim 17 is not an optimization of the permissible range set forth in Goudarzi, since paragraph 0026 already teaches that the optimal temperature range for the difference in liquidus temperatures is at most 5°C. Claim 17 thus sets forth a range for the difference in main peak temperatures which is not only not taught by Goudarzi but which is contrary to the teachings of Goudarzi. Therefore, for a person skilled in the art to select alloys such that the difference in main peak temperatures satisfies claim 17, it would be necessary for that person to ignore the teachings of Goudarzi. The Official Action is thus arguing that it would be obvious for a person skilled in the art to both follow the teachings of Goudarzi and simultaneously disregard them. These arguments are mutually incompatible.

Accordingly, since Goudarzi teaches away from a difference in the main peak temperatures of the first and second solder alloys of at least 20 °C as set forth in claim 17, a person

skilled in the art could not find any reason to modify Goudarzi in the manner proposed by the Official Action with respect to claim 17. Therefore, the grounds of rejection of claim 17 do not set forth a *prima facie* case of obviousness. Claim 17 is thus allowable.

The Applicants would like to specifically comment on two statements in the Official Action. Near the bottom of page 3, the Official Action states that in Goudarzi, the liquidus temperature of the first solder alloy is lower than that of the second solder alloy by not greater than 15°C. The Applicants cannot find any disclosure in Goudarzi which states that the first solder alloy has a lower liquidus temperature than the second solder alloy or indeed any disclosure of the liquidus temperature of the second solder alloy at all. Therefore, this statement in the Official Action appears to lack support.

Secondly, the top of page 4 of the Official Action states that one of ordinary skill in the art would "expect" that the content of In or Bi in the overall composition and in the first solder alloy powder of Goudarzi would overlap the contents set forth in the claims of the present application. It is unclear exactly what is meant by "expect" (it is not customary for an Official Action to conjecture what a person skilled in the art would "expect" a prior art composition to be), but the Official Action appears to be arguing that a person skilled in the art would decide what the contents of In or Bi in Goudarzi should be

based on the disclosure of the present application. If this is the case, then the Official Action is using the present application as a guide in deciding how to modify Goudarzi so as to result in a composition which overlaps that set forth in the claims of the present application. Doing so is clearly improper. A rejection must be based on the prior art cited by the Official Action, not on the choices made by the Applicants in creating their invention. To the extent that the claim rejections are being based on the disclosure of the present applications, those rejections are invalid.

In light of the foregoing remarks, it is believed that the present application is in condition for allowance. Favorable consideration is respectfully requested.

Respectfully submitted,

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Attachment
Declaration under 37 CFR 1.132 by Kaichi Tsuruta

Certificate of Transmission

I hereby certify that this correspondence is being facsimile transmitted to the Patent and Trademark Office
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Signature Michael Tobias
Michael Tobias